



Human Behavior In I/M Programs

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by

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Two Aspects of Human Behavior

- Vehicle adjustments and repairs prior to I/M test
 - reduce “baseline” emissions
 - smaller baseline means smaller reduction
 - “clean for a day” adjustments or long-term repairs?
- Program avoidance
 - vehicles that never report for testing: “no shows”
 - vehicles that fail initial test and never receive passing test: “drop outs”
 - if vehicles no longer in area, count as emission reductions
 - if vehicles driven in area, count as emission increases

Data and Analysis

- 3 years of Phoenix IM240 data: 1995 to 1997
- 19 months of remote sensing data: Jan 1996 to Aug 1997
- Track individual vehicles over 2 I/M cycles
 - 573,000 vehicles with initial IM240 in 1995

Analyzed 3 Groups of Vehicles, Based on I/M Results

- “Initial Pass”
- “Final Pass”
 - includes vehicles that passed retest without any repairs
- “No Final Pass”
 - includes vehicles with no retest
 - includes vehicles that failed subsequent retest
 - includes waived vehicles (unidentified; roughly 4% of failed vehicles)

Details of Phoenix I/M Program

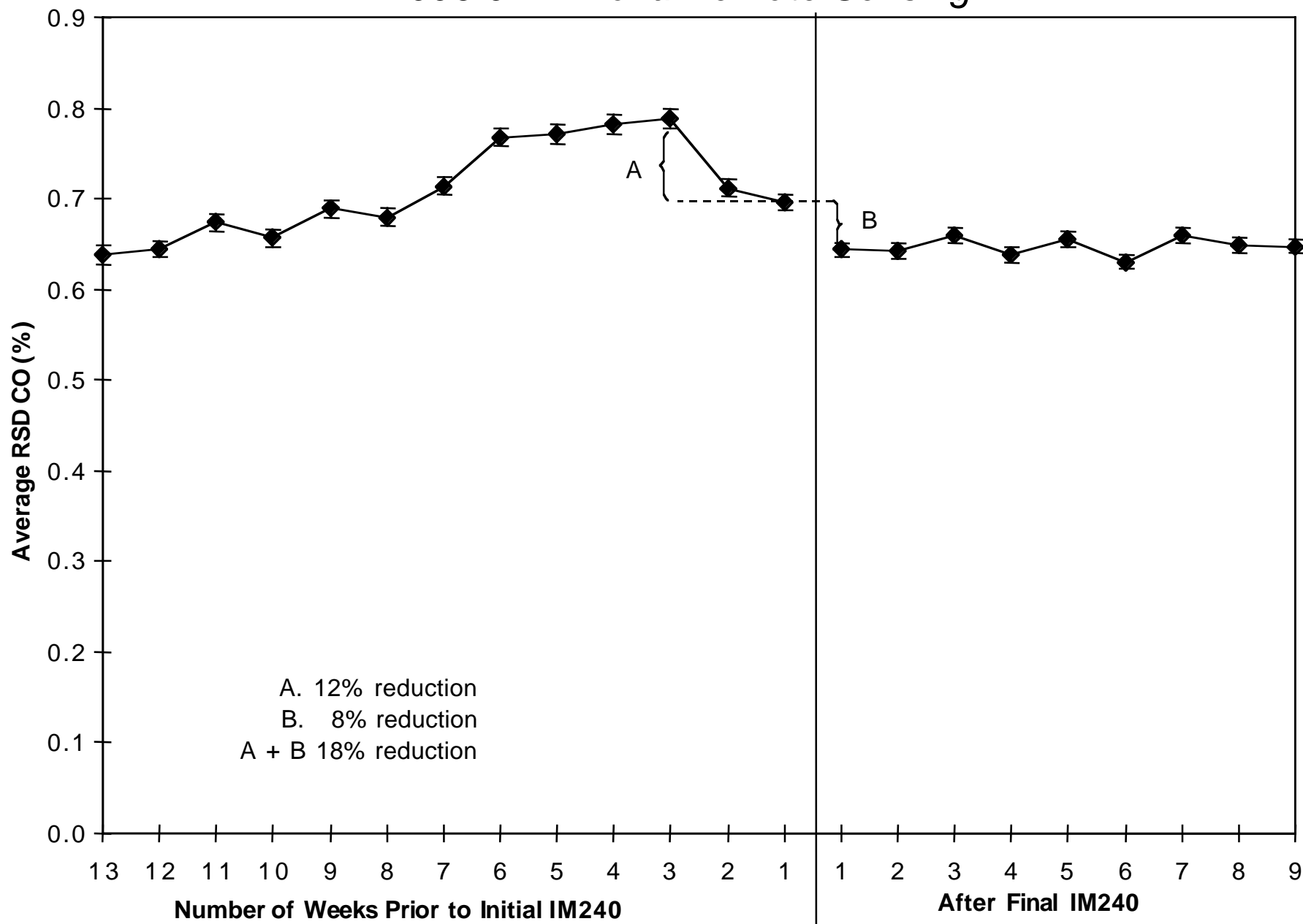
- I/M testing not required for change of ownership
- Test cycle does not change (renewal month is same over lifetime of vehicle)
- RSD vehicle identification made using I/M records not registration data
- License plate stays with vehicle when sold

Pre-Test Adjustments/Repairs

- Fleet CO emissions drop 12% in the three weeks prior to I/M test (13% for HC)
- For fleet, reduction from pre-test repair greater than reduction from post-test repair (8%)
- Smaller reduction from Initial Pass than Final Pass and No Final Pass vehicles

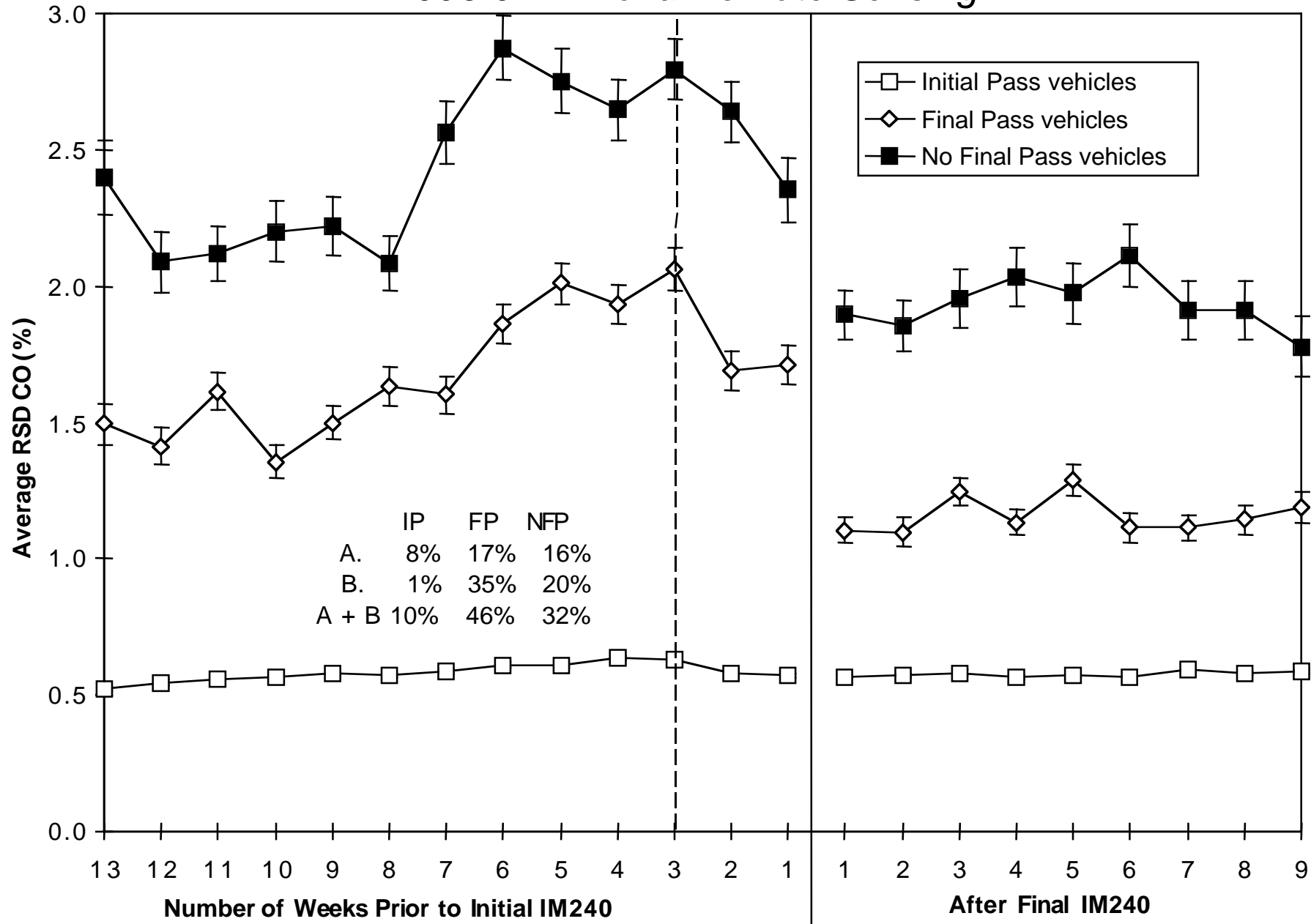
Average CO RSD Emissions by Time Period

1996-97 Arizona Remote Sensing



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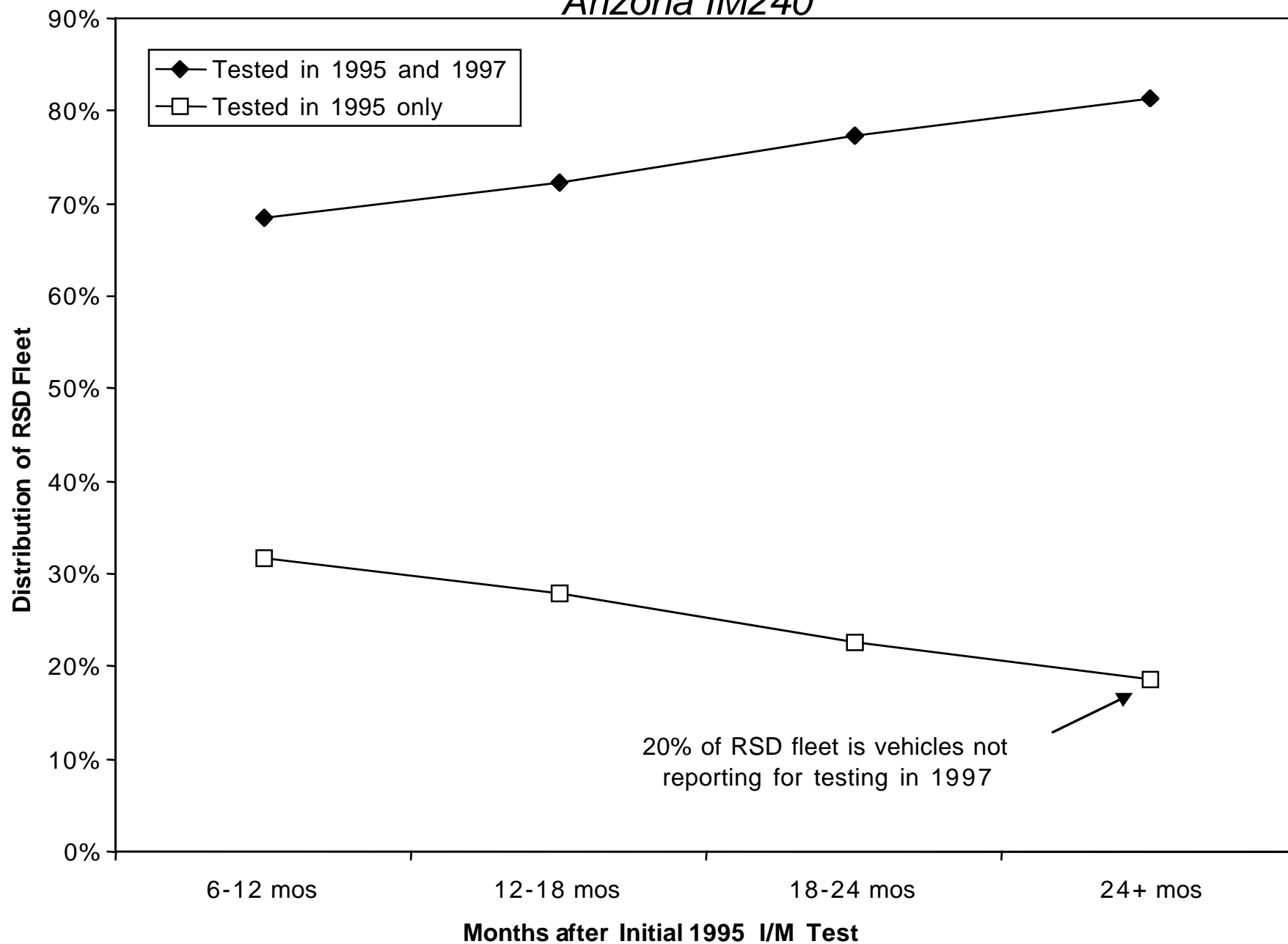


Program Avoidance: 1997 No Shows

- 40% of all vehicles tested in 1995 did not report for testing in 1997 (228,000/573,000)
 - 16% of 1997 No Shows (37,000) were off-cycle (“voluntary”) tests
 - 43% of 1995 voluntary tests (16,000) tested in 1996
 - tend to be older (57% of MY81, 40% of MY95 are No Shows)
 - tend to be dirtier (70% of 1995 No Final Pass, 37% of 1995 Initial Pass are No Shows)
- 20% of vehicles seen by remote sensing >2 years after 1995 I/M test did not report for 1997 testing
- An estimated 35% of 1997 No Shows were still driven in area
 - 4% of 1997 No Shows seen by remote sensing >2 years after I/M test
 - 11% of vehicles tested in both years seen by remote sensing
 - ratio of 4% to 11% = 35%

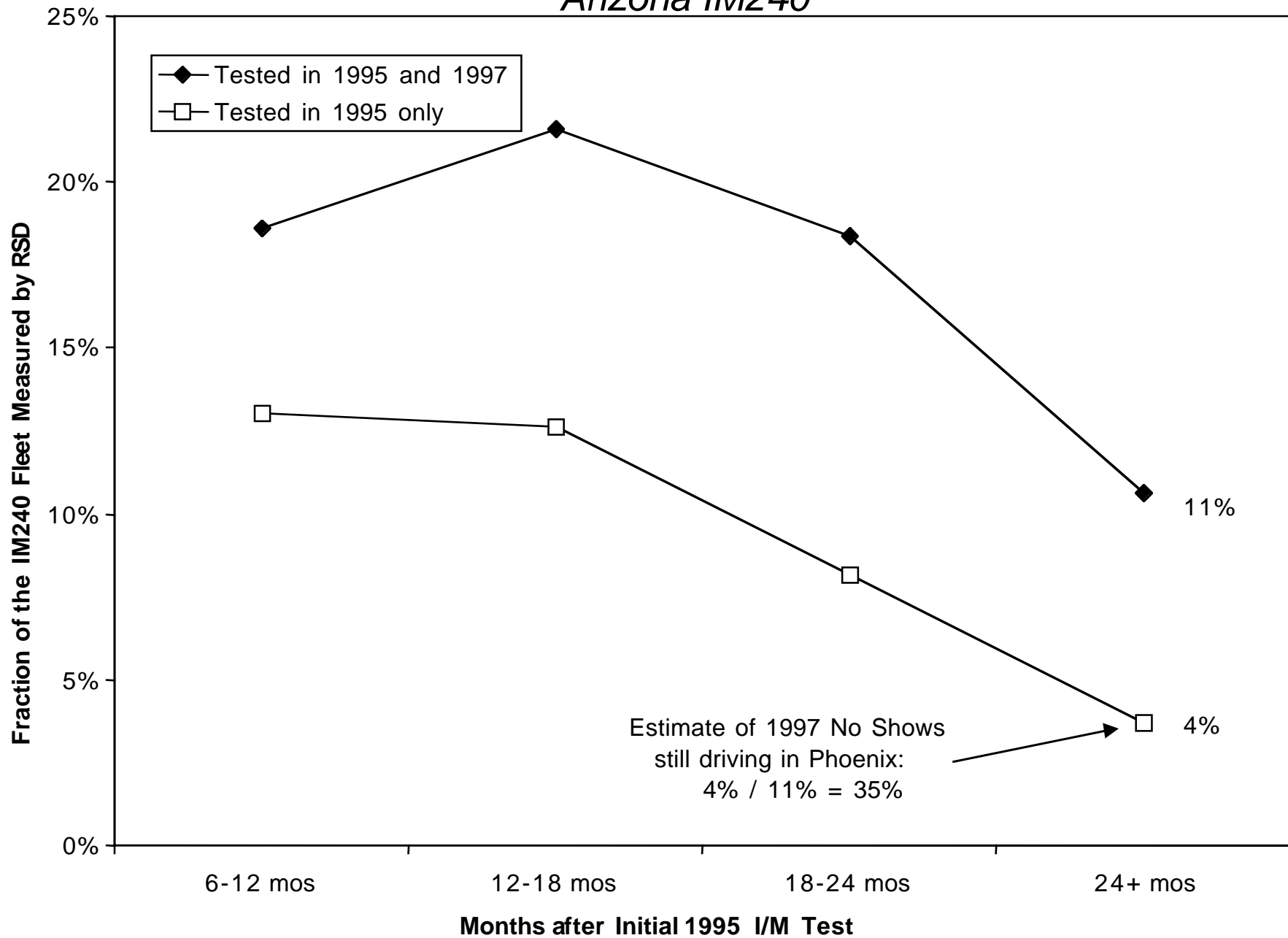
Distribution of the RSD Fleet, by I/M Test and Time

Arizona IM240



Fraction of the IM240 Fleet Measured by RSD, by Time

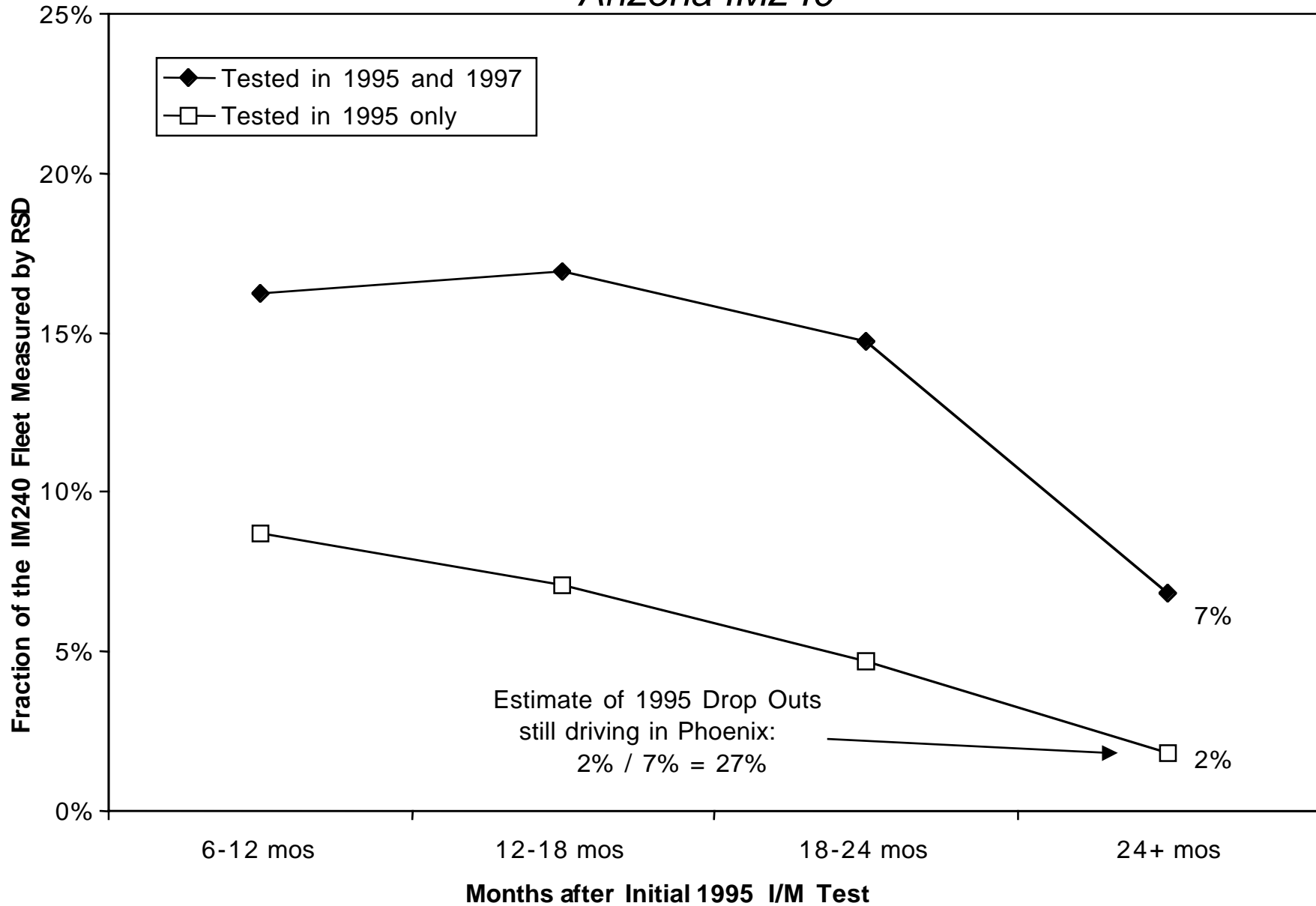
Arizona IM240



Program Avoidance: 1995 Drop Outs

- 39% of vehicles failing initial test in 1995 (23,000/61,000) never received a passing test (through end of 1996)
 - 30% of the 1995 Drop Outs reported for testing in 1997 (65% failed initial 1997 test)
- estimated 27% of 1995 No Final Pass vehicles avoided testing in 1997
 - 2% seen by remote sensing >2 years after I/M test
 - 7% of vehicles tested in both years seen by remote sensing
 - ratio of 2% to 7% = 27%

Fraction of the 1995 No Final Pass Vehicles
Measured by RSD, by Time
Arizona IM240



Summary

- Pre-test repairs/adjustments may dramatically increase (double?) program effectiveness; depends of if temporary adjustments or legitimate repairs
- 33 to 40% of vehicles tested in 1995 were 1997 No Shows
- 20 to 35% of No Shows were driven in area 2 years after 1995 I/M test
- 39% of vehicles tested in 1995 dropped out without a passing test; nearly 30% of these Drop Outs reported for testing in 1997
- 30% of 1995 Drop Outs were driven in area 2 years after 1995 I/M test
- Enforcing program participation is critical to success of I/M